

APPENDIX F**VEHICLE OPERATIONS IN DIFFICULT TERRAIN**

Military drivers must be able to adapt their skills to varying and often difficult terrain. This appendix contains information that will help drivers to perform safely and effectively in extreme conditions.

F-1. GENERAL OPERATIONAL GUIDELINES. The following general guidelines apply:

- When driving in mud or sand, or on rocky terrain, deflate tires (as recommended in your vehicle operator manual).
- Areas composed of water-soaked mud, clay, or silt may require the placement of logs, brush, gravel, wire netting, or other material to support the passage of vehicles. Such areas should be crossed carefully and without stopping, using low gear and all-wheel drive.
- Engage front-wheel drive for operation in soft sand or mud, and usually on rocky terrain. Low gear is also usually necessary on rocky terrain.

F-2. STARTING, STEERING, AND STOPPING. Techniques for starting, steering, and stopping on difficult terrain include:

- When starting in soft sand, select a low-gear range. Generally, second gear in low range is most effective.
- Start slowly and smoothly.
- Avoid unnecessary shifting of gears, especially in soft or poor traction areas.
- Avoid areas or patches of soft sand when possible. When this is unavoidable, increase speed before entering the soft sand area to gain momentum and maintain traction.
- In areas of soft, uncrusted sand and in rocky terrain, follow in the tracks of preceding vehicles whenever possible.
- When operating a vehicle over a sand dune, approach the dune as squarely as possible. Avoid going up on an angle.
- Use brakes sparingly to stop in soft sand. Permit the vehicle to roll to a halt.
- When stopping or halting on sand or other similar soft surfaces, stop or halt on a downhill slope (no matter how slight) to gain a starting advantage.
- Straddle undergrowth but avoid straddling rocks or boulders that might damage the underparts of a vehicle.

F-3. VEHICLE CARE. The following guidelines apply to vehicle care:

- Reinflate tires immediately upon leaving sand or rocky areas where deflation was required.
- Keep valve caps on all valves and carry spare valve caps. Check tire inflation.
- Inspect tires frequently. Remove stones or other foreign matter embedded in tires and remove rocks from between dual tires.
- Check engine temperature and oil pressure gauges frequently.

- Inspect fan belt, water pump, radiator, and radiator hoses frequently. Check closely for leaks and fan belt tension.
- If the engine overheats (for example, temperature gauge registers over 200°F), halt and check for the following:

- Loose or broken fan belt. Adjust or replace if necessary.
- Weak or broken radiator hoses.
- Level of coolant in radiator. Add water if required.
- Proper fit and pressure of radiator cap.
- Accumulated debris or material around radiator exterior that may interfere with proper radiator cooling.

Lastly, face the vehicle into the wind and run the motor at a fast idle.

- If overheating persists, stop the engine to prevent engine damage.
- If a fuel line vapor lock occurs during operation, pump the accelerator a few times or choke the engine slightly.
- If a vapor lock causes difficulty in starting, place a wet cloth around the fuel pump and the fuel filter to condense the vapor.
- Check the air cleaner more frequently than usual.
- Wipe and clean filler nozzles and the spouts of fuel containers before refueling.
- When water has to be added to the battery, use distilled water if possible. Avoid desert water. It usually has a high salt content.
- Inspect body bolts, springs, spring mountings, and accessories more frequently than usual for evidence of looseness or damage caused by the abnormal shock and vibration from operating over rough terrain.
- Change the oil more frequently than normal during operations in the desert or rough terrain. A drop of oil from the dipstick may be rubbed between the fingers to determine the presence of a foreign or gritty substance.
- Wipe oil can spouts clean before adding engine oil. Clean away accumulations of sand or dirt from the oil filler hole.
- After operating in sandy or dusty terrain, remove the air filter and the crankcase oil filler cap. Clean and dip in engine oil, allowing the excess oil to drain off before replacing.
- Inspect and clean constant-velocity joints frequently.

F-4. FREEING VEHICLES STUCK IN SAND OR MUD. Most military vehicles have sufficient power in low gear to pull out of sand or mud, provided the wheels gain traction. If a vehicle is stuck or is about to become stuck--

- Use the lowest gear (forward or reverse) for the pullout effort.
- Use all-wheel drive if the vehicle is so equipped.
- Use brush, logs, wire netting, gravel, rocks, or other available materials under the wheels to gain traction.
- When forward progress is stopped, try to back up slightly and then start forward with sufficient power to overcome the resistance of sand and mud. Also, selecting a new forward course may offer a traction advantage.
- Clear away sand or mud from in front of all the wheels. This will often allow the truck to pull free and regain forward progress.

- If it becomes evident that continued operation of a vehicle under its own power will only cause it to sink deeper in the sand or mud, use the vehicle winch or a tow vehicle.
- Disengage the trailer if a trailered load has swung to one side or doubled up on the towing vehicle. Maneuver the towing vehicle into the line of direction of the trailer, reengage it, and move off in the new direction.

F-5. PRECAUTIONS FOR OFF-THE-ROAD OR DIFFICULT TERRAIN. Observe the following precautions when driving off-the-road or over difficult terrain:

- Guard against mechanical troubles by making all proper vehicle inspections and by driving as recommended.
- Use fuel economically in sandy or rocky terrain because fuel consumption is high in such operations.
- Use water sparingly in areas where it is in short supply.

For further discussion of operational difficulties, consult FM 21-305, the appropriate vehicle manual, or relevant publications listed in this manual's references.